# - SAFAPS SIM ARCHITECTURE DOCUMENT

Jeremy Harrault

**SWORDFISH** 

– SAFAPS SIM –	Publication date	26/01/2016	- SPARCS -
Stress and Fatigue			5.755
Audit and Prediction	Project name	SAFAPS SIM	Software Product Architecture Resources Control System
Service Simulator	Subject	Architecture Document	Resources Control System
	Chapter name	Objectives of this document	

# Objectives of this document

The purpose of this document is to present the architecture of the SAFAPS SIM project. It will contain diagrams as well as explanations to describe the architectural choices in order to fulfil the requirements. The information contained in the document act as a guide in order to fully develop, deploy and setup SAFAPS.

<ul><li>– SAFAPS SIM –</li></ul>
Stress and Fatigue
<b>Audit and Prediction</b>
Service Simulator

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– SPARCS –Software Product ArchitectureResources Control System

# Glossary and Terminology

- A -

API: Application Programming Interface

\_ J \_

JSON: JavaScript Object Notation

-R-

REST: Representational State Transfer

-S-

S&F: Stress and Fatigue

SAFAPS: Stress and Fatigue Audit and Prediction Service

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# **Document Description**

Title	SAFAPS SIM : Architecture Document	
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Date	Rev.	Author	Modified Section(s)	Comments	
25/01/16	0.1	Jeremy Harrault	All	Add empty sections.	
28/01/16	0.2	Jeremy Harrault	3.	Add context and database view.	
29/01/16	0.3	Jeremy Harrault	3.	Add invoice table in database view and add additional information.	
02/02/16	0.4	Jeremy Harrault	1. 3.	Remove "Introduction and Management Summary" part. Add the general architecture principals. Add standardization from information viewpoint.	
04/02/16	0.5	Jeremy Harrault	3	Explanation "datetime".  Modify Database standardization rules	
05/02/16	0.6	Jeremy Harrault	3.	Move foreign key between Evaluation and Result into Evaluation table. Add section for status of S&F evaluation Add "status" column in database to "evaluation".	
05/02/16	0.6.1	Jeremy Harrault	1. 3.	Show the asynchronous process in Global architecture diagram.  "S&F Evaluator" => "S&F Evaluator Service"	
09/02/16	0.7	Jeremy Harrault	1. 2. 3.	Describe the goal of SAFAPS SIM Add architectural decisions and their advantages Add functional viewpoint	

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## 1. General Architecture Principles

#### 1.1. Web application

SAFAPS SIM is a Web application that can be reached using HTTP. It includes an API that handle the business to be performed. This API can be called by any HTTP client; that is either humans directly requesting the server from a browser for instance or other systems which need Stress and Fatigue information.

Beside the API which returns raw data, SAFAPS SIM can also return these data wrapped in a user interface to be displayed onto a browser and become more human readable.

The SAFAPS SIM API is compliant with the REST architecture.

#### 1.2. Global Architecture

The architecture of SAFAPS SIM presents distinct layers, each of them fulfilling their own tasks.

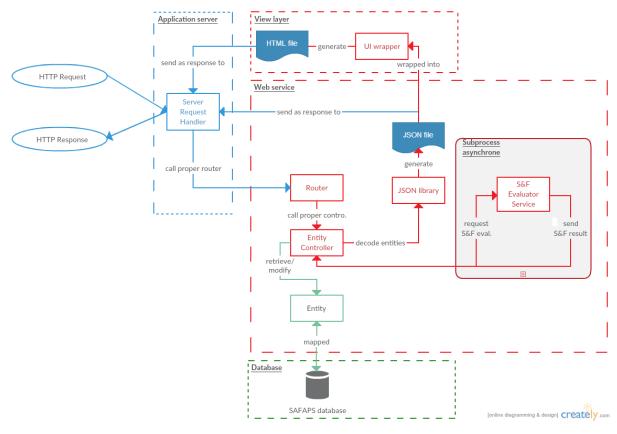


Figure 1.1: SAFAPS SIM global architecture

Layer	Description	
Application server	The application server is first layer that the request goes across. This layer is	
	between the software application and the operating system that the web server	
	is running on. It catches the HTTP requests received by the server and pass it to	
	web service.	

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Layer	Description
Web service	The web service includes all business logic that will be computed. It includes the router which will call controllers depending on the resource pointed by the request.  Controllers can then access and modify values within entities and call the S&F evaluator by launching an asynchronous process. The input and output handled by the web service are formatted in JSON.
Database	The layer is in charge of storing data.
View layer	The view layer is used to lay out the data returned by the web service within HTML to present data onto browser for example and therefore become more human readable.

Table 1.1: SAFAPS SIM global layers

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## 2. Architectural Design Decisions

#### 2.1. Rest Architecture

The core of SAFAPS SIM is a RESTful web service. REST uses simple HTTP as the communication protocol between the client and the server.

Using HTTP already defines of way of performing requests with URL and HTTP methods.

Unlike SOAP, REST does not need to send the format of the response returned by the server. It facilitates the call to the web service on the client side since it does not need any libraries or extra component to decode the response.

Therefore, testing a REST architecture can be done very easily using a browser.

#### 2.2. PHP

SAFAPS SIM is coded in PHP. This language offers different advantages:

- Open-source language: It makes the support and the extensibility of the language easier considering the huge community of PHP developers.
- Good documentation: Besides the official PHP documentation which is very complete, a lot of technical trouble can be resolve after a search on internet.
- Easily deployed: PHP is a scripting language which does not require any compilation. The PHP file only needs to be placed into the server directory.
- Optimized for building web applications: PHP natively provides tools and features like accessing method and URL of the requests as so that the development of
- Well-known language: A lot of people are using PHP. Then, it is easier to find programmers PHP skills who can handle the project.

#### 2.3. Symfony2 Framework

The codebase of SAFAPS SIM is running with Symfony2 framework. This choice has been made many reasons:

- Premade skeleton: Symfony2 pre-define the architecture basics of the web application.
- Saving time: Using a framework is a gain of development time since a big part of the work is already coded. The developers can focus on the business part of the application.
- Already experienced team: The development team is already familiar with this framework, reducing the learning phase.
- Extensible: Some "bundles" can be plugged to Symfony2 if need be, adding then new features to the system to be built either at runtime or at the development time.

#### 2.4. S&F Evaluator Sub-process

In order to avoid the client to be blocked waiting for the server delivering the response to the S&F request, SAFAPS SIM will execute these kind of request asynchronously.

For that purpose, a parallel process in charge of executing S&F request will be running when a S&F request is submitted. Once the result generated, it will be sent back to the client.

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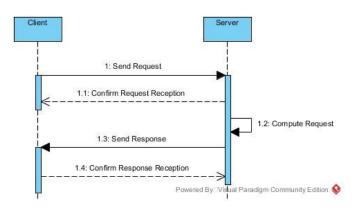


Figure 2.1: Asynchronous call for S&F request

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#### 3. Viewpoints and Views

#### 3.1. Context Viewpoint

SAFAPS SIM is a system that is mainly used by external systems from external organizations. Managers from such organizations can use SAFAPS through their own internal system. For security concerns, managers get authenticated by SAFAPS SIM using their unique authenticating keys. Managers are not supposed to request SAFAPS SIM directly.

Once the evaluation has been performed by SAFAPS SIM, it will be sent back to the organization's system.

When managers are added to or removed from the organization's system, it notifies SAFAPS SIM so that the new managers are added to or removed from SAFAPS SIM too.

The SAFAPS SIM system is not free of charge and organization using SAFAPS must pay for it. Periodically, invoices are automatically sent by SAFAPS SIM to organizations. External organizations' financials can consult such invoices for the organization in two ways. They either can consult them from their mail or directly from SAFAPS SIM website.

SAPAFS SIM is a simulation software. To limit the work to do on the back-end of SAFAPS website, the information about the organizations is filled in SAFAPS SIM by the SAFAPS administrators.

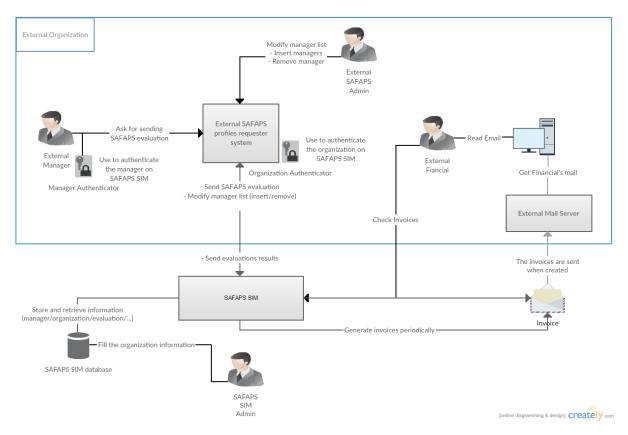


Figure 3.1: Context diagram

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#### 3.2. Functional Viewpoint

#### 3.2.1. Functional parts

#### 3.2.2. Preparing and Routing Requests

When a client requests SAFAPS SIM, the first task to be done is routing the request. It consists in calling the proper function according to the resource and the method of the HTTP request.

This part is mainly handled by components set up by Symfony2.

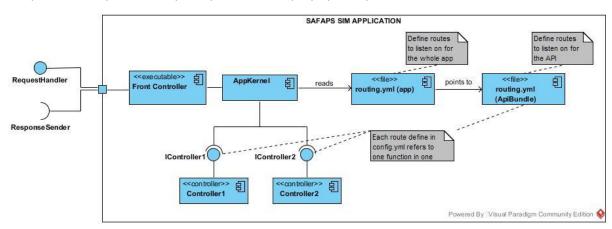


Figure 3.2: Component diagram for routing requests

Component	Description	
Front Controller	It is first script that is called after receiving the request. It sets the global	
	environment settings (production, debug, testing)	
App Kernel	It loads all Bundles needed by the application to work. It also calls the proper	
	controller based on the resources and the routing file.	
routing.yml	The routing files define which controller should be called according to the	
	resource pointed in the request.	
IControllers	These interfaces are built from the routing.yml files. Indeed, they include	
	functions to be implemented according to which functions have been defined as	
	to be called by the routing.yml	
Controllers	They are classes implementing the IControllers interfaces.	

Table 3.1: Component descriptions for routing request

#### 3.2.3. Managing Entities

The process of executing the request, retrieving, creating or modifying entities is conducted by the controllers

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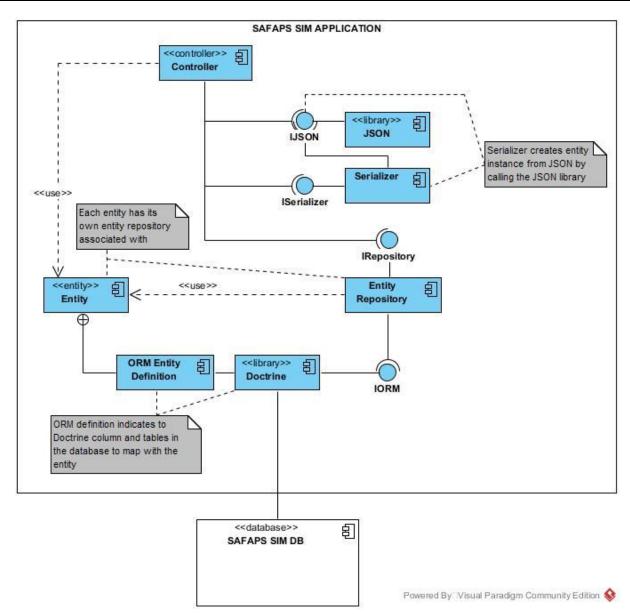


Figure 3.3: Component diagram for managing entities

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#### 3.2.4. S&F Evaluators

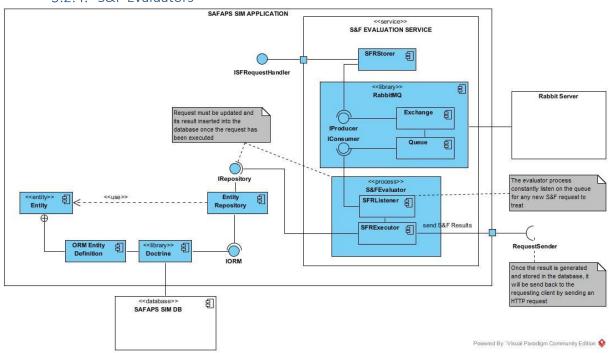
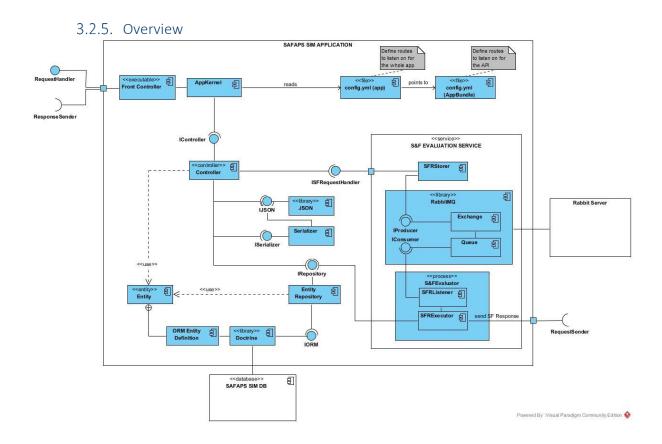


Figure 3.4: Component diagram for executing S&F requests



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This diagram shows the wide view of how elements are interacting with each other within the Symfony2 Framework.

### 3.3. Information Viewpoint

#### 3.3.1. S&F Evaluation Request States

The S&F requests go through different states from the creation to the point of they are actually performed.

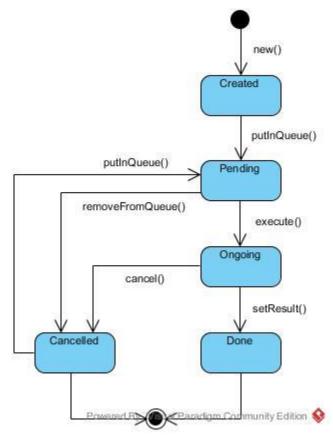


Figure 3.5: State Chart of the S&F evaluation request

State name	Description	
Created	When the evaluation request is instantiated and inserted into the database, its	
	status is created.	
Pending	When the evaluation request is put in the queue awaiting to be treated by the	
	S&F evaluator service.	
Ongoing	When the evaluation request is taken from the queue in order to be treated by	
	the S&F evaluator service.	
Done	When the result of the S&F evaluation request is set and inserted inside the	
	database.	
Cancelled	When the S&F evaluation request has been remove from the queue or the	
	execution of the request has been interrupted.	

Table 3.2: Description of S&F evaluation request states

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#### 3.3.2. Database View

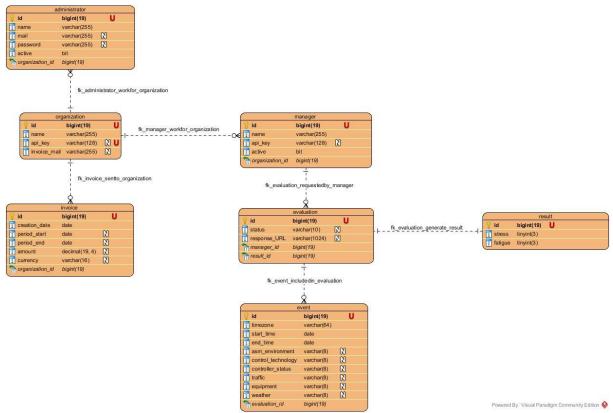


Figure 3.6: Database entity diagram

Some **additional information** regarding this diagram needs to be given in order to fully understand how to manipulated this presented data:

Table	Column	Additional information		
- administrators	- active	The active field represent whether the account is still authorized to use		
- managers		SAFAPS SIM functionalities. The type of this field represent a data with only		
		2 exclusive possible values. Depending on the database implementation,		
		these values can either be TRUE/FALSE or 1/0. Both are correct.		
- invoices	- currency	The currency of the invoice is stored as locale as describe in the RFC 4646		
		(e.g. en_US, en_UK).		
	- amount	The amount is a floating number that can have up to 4 decimals. The stored		
		value is the amount of the invoice converted into the currency stored in		
		the invoice.		
- evaluation	- status	It defines the status of the request. The possible values can be:		
		- "create"		
		- "pending"		
		- "ongoing"		
		- "done"		
		- "canceled"		
- events	- timezone	The time zone of the event is stored as a string in the format		
		"Continent/City".		
	- start_time	These "date" fields store a date in the calendar (MM/DD/YYYY) and a time		
	- end_time	(hh:mm:ss). On some database instance, this type is also called "datetime"		

Table 3.3: Database entity additional information

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**Warning**: This diagram has been made without considering the database type or version which is used in the project. It offers a generic model showing how the data are stored and related to each other.

- 3.4. Concurrency Viewpoint
- 3.5. Development Viewpoint
  - 3.5.1. Symfony2 file system
  - 3.5.2. Database Naming Convention

Hereafter is the naming convention and other rules adopted for the database implementation.

#### Tables:

• The table names are fully given in low camel case (lowercase letter with '\_' as space between words).

Do	Don't
organizations	Organizations (first letter is uppercase)
organization_invoices	organizationinvoices (no '_' between words)

Table 3.4: Example of naming database tables

#### Table IDs:

- Each table representing an entity must have an ID. Only tables made for many-to-many relationships may be without any ID.
- o Entities' ID are "bigint" stored over 19 bits
- o Entities' ID are unique, "non-nullable", primary keys.
- o Entities' ID named 'id'

#### Foreign keys:

- Foreign keys are supposed to represent one-to-many or one-to-one relationships between two tables.
- o Each of these relationships needs to be defined using a verb.

#### Example:

One	Can be related to	Verb
Organization	(many) Invoices	Invoices are => 'send to' => Organization
Evaluation	(many) Events	Events are => 'included in' => Evaluation
Evaluation	(one) Result	Result is => 'calculated from' => Evaluation
Result	(one) Evaluation	Evaluation is => 'generating' => Result

Table 3.5: Example of verbs for database table relationships

**Note**: For one-to-one relationship, either one or the other table is able to store the foreign key (but not both at once).

O Foreign keys must be named <fk table name> <fk attribute name>

#### Example:

ipie.				
Do	Don't			
organization id	organizationid			
evaluation_id	workfor			
organization id	administrator organization id			

Table 3.6: Example of naming foreign keys between database tables

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# 3.6. Deployment Viewpoint

- 3.6.1. Production Environment
- 3.6.2. Development Environment
- 3.6.3. Testing Environment
- 3.7. Operational Viewpoint

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# 4. Quality Property Summary

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# 5. Important Scenarios

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# 6. Issues Awaiting Resolution

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